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Fickeisen Plains Cactus **(*Pediocactus peeblesianus* ssp. *fickeiseniae*)**

Monitoring Report
Salt Trail Canyon Monitoring Site

2006 - 2008



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INTRODUCTION

Seven species of *Pediocactus* are known from the western United States, from the Columbia River Basin south to the Great Basin and the Rocky Mountains to the Colorado Plateau. Six of these species, including *P. peeblesianus*, are highly restricted endemics. There are two currently recognized subspecies of *P. peeblesianus* to include ssp. *fickeiseniae*, and ssp. *peeblesianus*. Although endemic to northern Arizona, *Pediocactus peeblesianus* ssp. *fickeiseniae* is much more widespread than the endangered subspecies *peeblesianus*. Although first collected and reported in 1956, the original variety, *Pediocactus peeblesianus* var. *fickeiseniae* L. D. Benson, was not validly published. It was published in 1999 as a subspecies of *P. peeblesianus* (*Pediocactus peeblesianus* (Croizat) L. D. Benson ssp. *fickeiseniae* (Backeberg ex Hochstätter) Lüthy, Kakteen And. Sukk. 50: 278. 1999). *P. peeblesianus* ssp. *fickeiseniae* was named after one of its first collectors, Florence Fickeisen of Phoenix, AZ.

Fickeisen Plains Cactus is a narrow endemic restricted to Kaibab Limestone derived soils in northern Arizona (Coconino and Mohave counties). Like most *Pediocacti*, this species seems to have low reproductive capacity, even after favorable weather conditions. It occurs on soils overlain by Kaibab Limestone in Navajoan desert or Great Plains Grassland, along canyon rims and flat terraces along washes, typically with limestone chips scattered across the surface. Populations are known to occur between 4000 and 5600ft in elevation. The Fickeisen Plains Cactus occurs on lands managed by the Bureau of Land Management (BLM), Navajo Nation, Hualapai Nation, Arizona State Land Department, and the U.S. Forest Service. It also occurs on private land.

Known threats include off road vehicles use, livestock grazing, mining, recreational activities, road construction, illegal collection, and herbivory. The impact of invasive species on the germination and established of seedlings may be an important factor in the decline of this species on the Navajo Nation.

Plant Description: Stems 2.5 – 6.0 cm tall, 2.0 – 5.5 cm in diameter, spherical, usually solitary. Spines corky; central spine 1, 5 – 18mm long, radial spines 3 –7, each 4 –7 mm long. Flowers cream-yellow or yellowish-green, to 2.5 cm diameter, produced on the apex of the stem. Fruit top-shaped, smooth, turning reddish brown upon maturity. Flowering and fruiting occurs from mid March to late April, plants may retract into the soil in response to drought.

METHODS

Four circular monitoring plots were established in the vicinity of Salt Trail Canyon on the Navajo Nation in April of 2006. The center of each plot is marked with a large nail and the plots have a radius of 4m measured from this nail. Each cactus is individually tagged and measured from the center nail and given an azimuth. Recorded are reproductive status (buds, flowers, immature fruit, mature fruit, aborted flowers/fruit, vegetative), plant diameter (cm) and vigor (1=excellent, 2=good, 3=fair, 4=poor, dead). Measurements are taken annually during the same week in April.

RESULTS

In 2008, 143 cacti were located in the 4 monitoring plots. Nine plants were found dead and 7 were not relocated from the previous year. Twelve new plants were recorded, mostly in Plot 2 (Figure 1).

Reproductive effort in 2006 and 2007 was very low when compared to 2008 (Figure 2). 205 reproductive structures were found on 98 plants in 2008 compared to 36 and 3 in 2006 and 2007 respectively. The majority of reproductive structures in 2008 were buds and flowers. During the previous two monitoring years only buds were found on reproductive plants, no flowers, fruit or other reproductive structures (Figure 3). The distribution of diameter size classes shifted from 2007 to 2008 from a majority of plants found in diameter size classes 1 – 1.99cm and 2 – 2.99 cm categories to the majority found in the 2 – 2.99 and 3 – 3.99cm categories (Figure 4). Two plants had a diameter larger than 4.00cm in 2008. None were in that category in 2006 or 2007. No seedlings were found in 2008 in any of the 4 monitoring plots (plants with a diameter of <0.99cm).

Vigor of all plants was remarkably similar among all cacti during all 3 monitoring years, with the majority rated in excellent health (Figure 5). In 2008, 85% of all cacti were in excellent health and 13% were in good condition. Only 3 plants were rated fair and one plants was in poor condition.

DISCUSSION

Currently there are 15 populations of Fickeisen Plains Cactus known from the Navajo Nation. Most of these have very low numbers of individuals, typically less than twenty plants per population, and often only one or two plants. Intensive surveys during 2004 & 2005 located about half of these populations. Re-surveying of known populations resulted in substantially fewer plants than originally reported. These results prompted concern for the status of *Pediocactus peeblesianus* ssp. *fickeiseniae* on Navajo Nation lands. The Salt Trail Monitoring Site is the largest population of this species known from the Navajo Nation. It was established in 2006 to get a better understanding of the long-term population dynamics of this species.

After only three years of monitoring little can be deduced about the trends in this population. The population increases between 2006 and 2008 was attributed to increased survey effort in 2007 and 2008, not to recruitment since 2006. Most of the additional plants were found in Plot 2, which in 2008 counted 90 plants within the 4 m radius. High densities of cacti in such a small area make it difficult to count all plants and to not miss any. No seedlings were found in 2008 in any of the 4 monitoring plots (plants with a diameter of <0.99cm).

Increased mortality in 2008 occurred primarily in Plot 1 (6 of the nine dead cacti). All the dead cacti were located next to each other in a depression. An animal bedding down may have dug the depression. Although no changes or impacts were noted in 2006 or 2007, severe impacts by livestock, especially sheep have been documented from the

monitoring site in 2005. After documenting primarily only budding plants in 2006 and 2007 it was decided to delay monitoring for one week in 2008 to capture the full reproductive effort of the cacti. Reproductive effort was high in 2008, which was consistent with other rare cacti monitored on the reservation this spring, likely due to increased winter precipitation. Generally this population of cacti is in excellent health and has not shown any signs of poor or decreased vigor over the past 3 years, despite varying amounts of rainfall. No disease or insect predation has been observed. Other potential threats to the site and the population of *Pediocactus* may be a very high reported density of annual exotic species such as red brome (*Bromus rubens*) and storksbill (*Erodium cicutarium*) during high rainfall years. Impacts on the germination and establishment of *Pediocactus* seedlings are currently unclear and warrant further study.

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Table 1. Total number of *Pediocactus peeblesianus* ssp. *fickeiseniae* plants in 4 monitoring plots at the Salt Trail Canyon monitoring site

Plot #	2006	2007	2008
1	19	18	14
2	66	85	90
3	14	19	18
4	20	24	21
Total	119	146	143

Table 2. Size class distribution for *Pediocactus peeblesianus* ssp. *fickeiseniae* plants in 4 monitoring plots at the Salt Trail Canyon monitoring site

Size class	2006	2007	2008
Multi-head	4	5	4
0 - 0.99cm	3	2	0
1 - 1.99cm	28	41	12
2 - 2.99cm	56	71	65
3 - 3.99cm	28	27	60
4 - 4.99cm	0	0	2
Total # of plants	119	146	143

Table 3. Phenology of *Pediocactus peeblesianus* ssp. *fickeiseniae* plants in 4 monitoring plots at the Salt Trail Canyon monitoring site from 2006 to 2008. Figures represent the number of reproductive structures, not the number of plants

Phenology	2006	2007	2008
Buds	36	3	97
Flowers	0	0	104
Post-Flower	0	0	0
Immature Fruit	0	0	0
Mature Fruit	0	0	0
Aborted Flowers/Fruit	0	0	4
Total	36	3	205

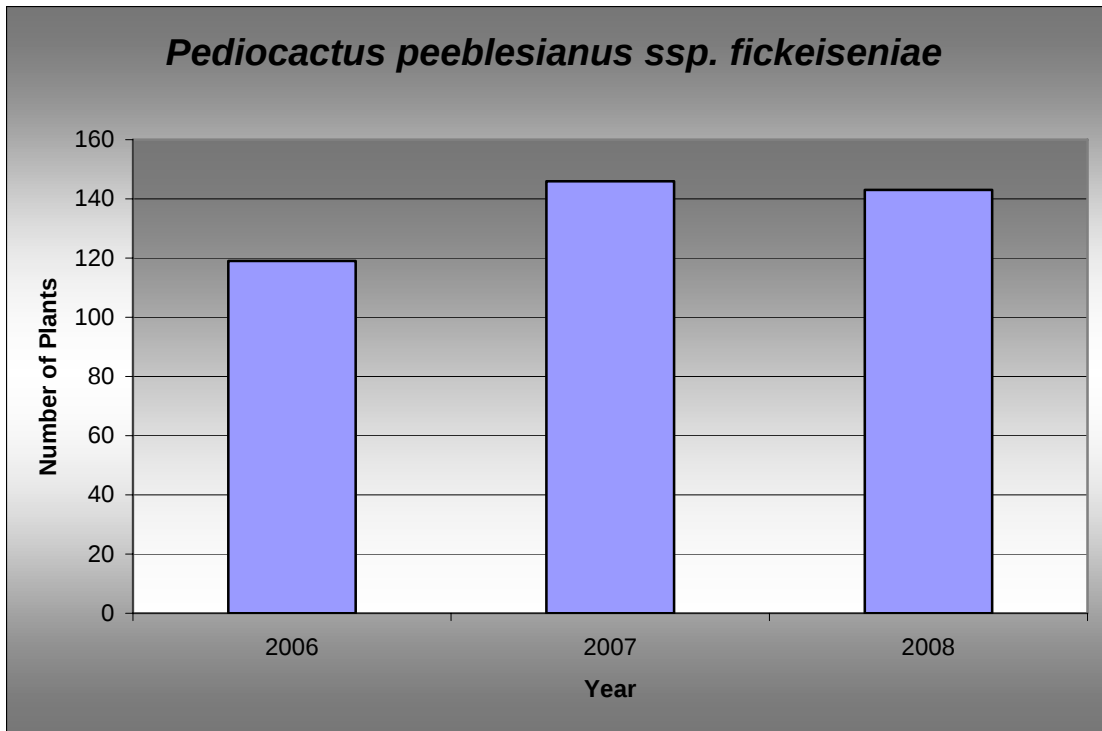


Figure 1. Number of *Pediocactus peeblesianus* ssp. *fickeiseniae* plants in 4 monitoring plots near Salt Trail Canyon, Coconino County, AZ, from 2006 – 2008.

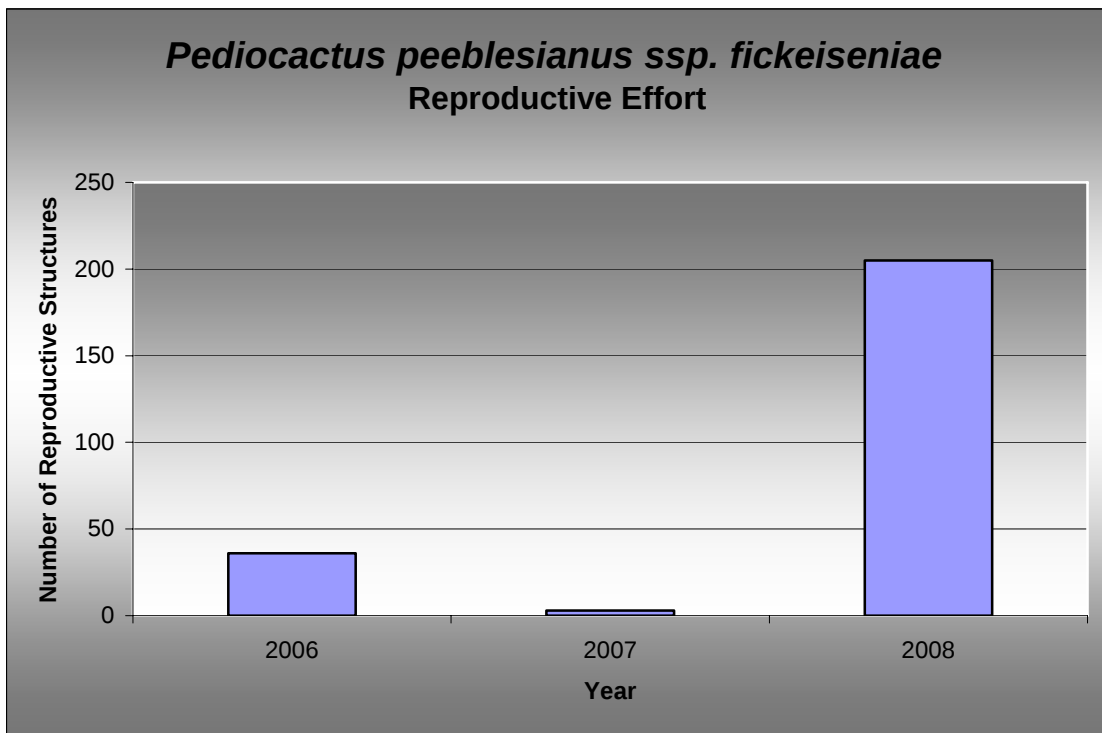


Figure 2. Reproductive effort by *Pediocactus peeblesianus* ssp. *fickeiseniae* plants in 4 monitoring plots near Salt Trail Canyon, Coconino County, AZ, from 2006 – 2008.

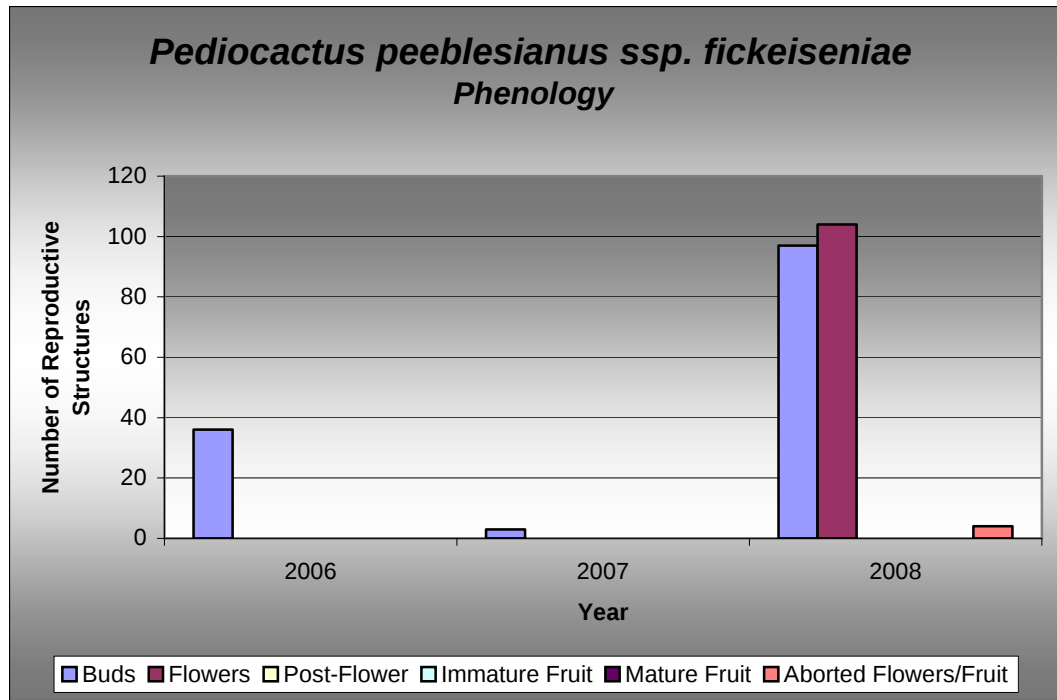


Figure 3. Distribution of reproductive structures on *Pediocactus peeblesianus* ssp. *fickeiseniae* plants in 4 monitoring plots near Salt Trail Canyon, Coconino County, AZ, from 2006 – 2008.

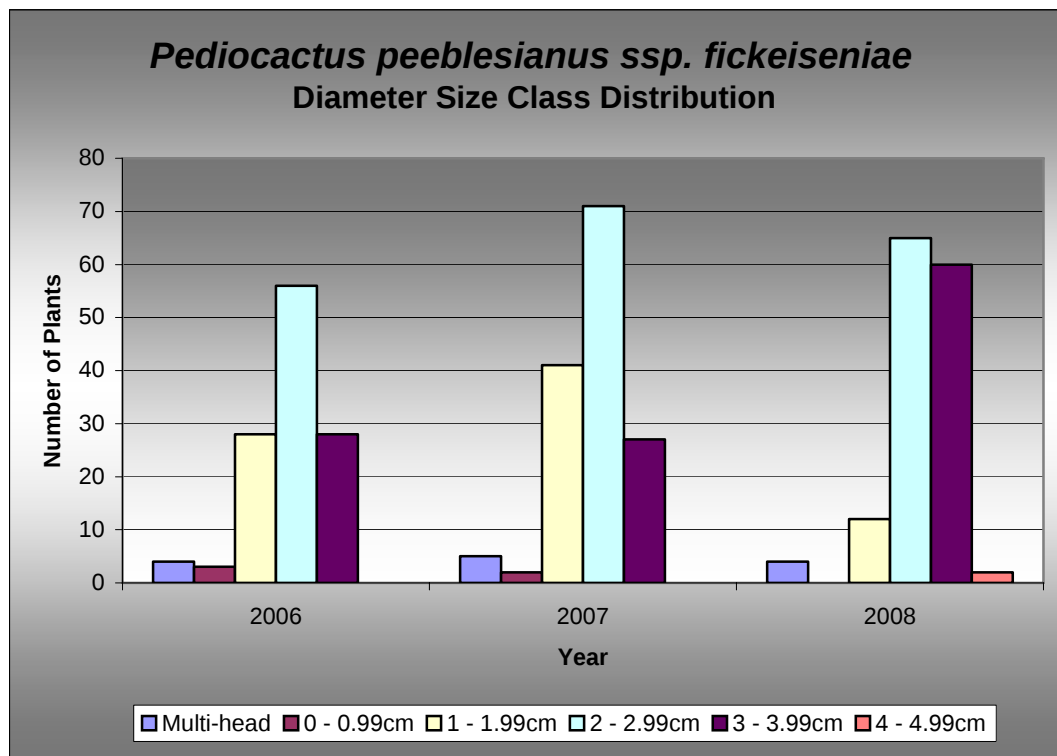


Figure 4. Diameter size class distribution of *Pediocactus peeblesianus* ssp. *fickeiseniae* plants in 4 monitoring plots near Salt Trail Canyon, Coconino County, AZ, from 2006 – 2008.

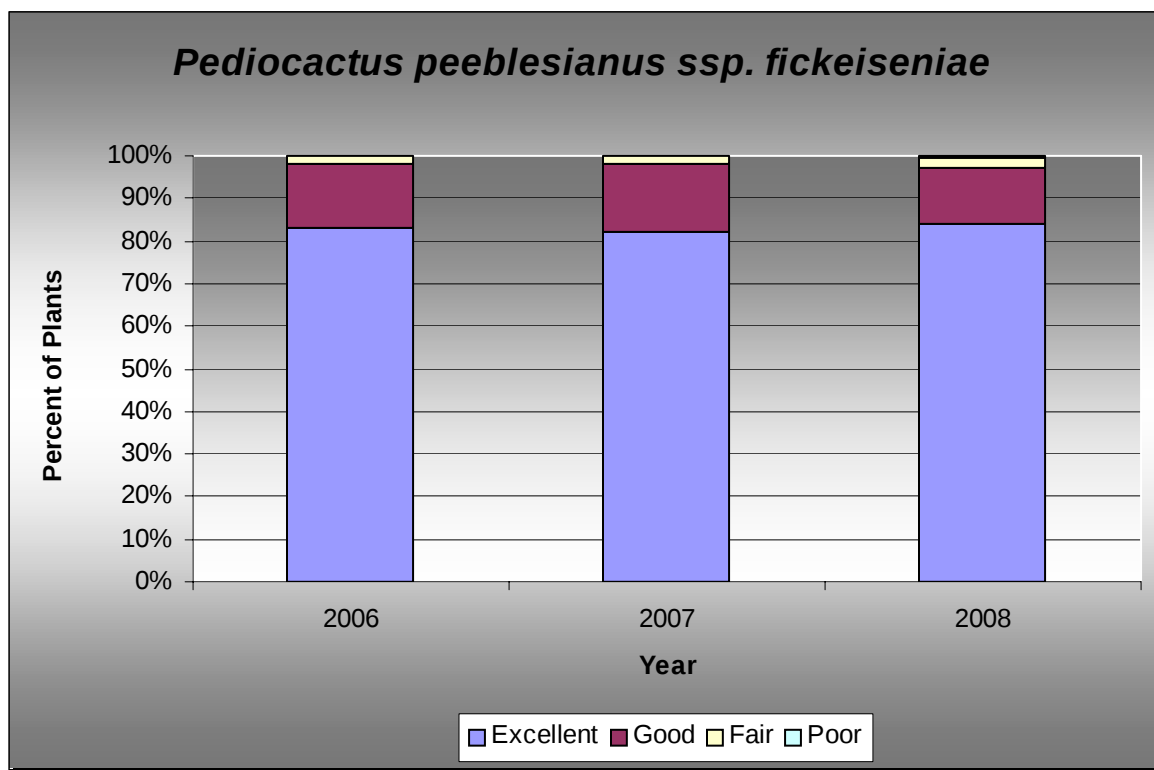


Figure 5. Vigor of *Pediocactus peeblesianus* ssp. *fickeiseniae* plants in 4 monitoring plots near Salt Trail Canyon, Coconino County, AZ, from 2006 – 2008.